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TUMBLER-SNAPPER

NEVADA PROVING GROUNDS

April-June 1962

PERMETER MOD II

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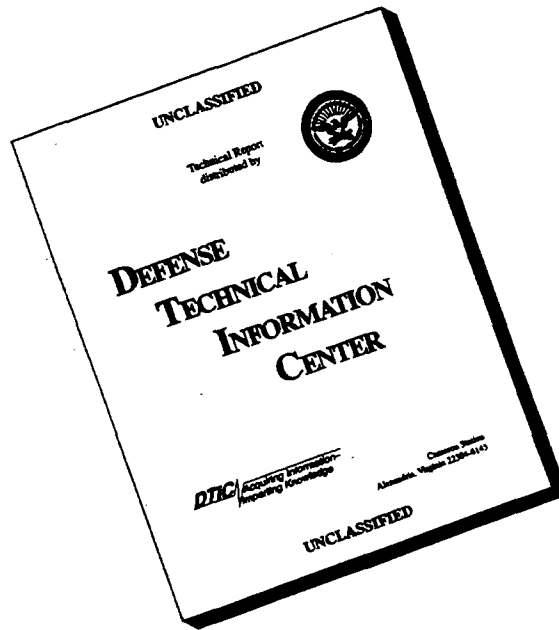
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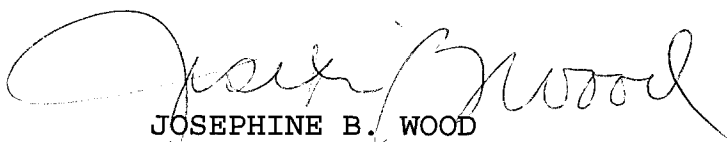
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Report to the Test Director

# BHANGMETER MOD II

Operation Tumbler-Snapper

By  
Herbert E. Grier  
and  
Staff

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## ABSTRACT

The Mod II Bhangmeter used for Operation Tumbler-Snapper was developed for Operation Buster-Jangle. It is a device for determining the yield of an atomic explosion photoelectrically. A measure of the visible radiation as a function of time provides a basis for scaling the device under measurement against previously detonated weapons of known yield.

The evaluation of this instrument can be traced through previous reports such as Air-Drop Instrumentation, Bhangmeter, Greenhouse Report, Annex 1.9, Part I, WT-92, September 1951; Bhangmeter Calibration, EG&G Report No. 1065, dated 14 December 1951; Bhangmeter Readings on Buster-Jangle, EG&G-OUT 815, dated 19 December 1951; and Bhangmeter Mod II, Buster-Jangle Project 10.3b Report, WT-403, November 1952.

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## BHANGMETER MOD II

### 1 INTRODUCTION

The history, construction, and operation of the Bhangmeter Mod II are given in the EG&G report Bhangmeter Mod II, Buster-Jangle Project 10.3b Report, WT-403, November 1952. The Buster-Jangle report contains photographs of the equipment and all 27 records obtained on that operation, as well as a graphical presentation of observed time-to-minimum vs absolute yield for Sandstone, Ranger, Greenhouse, and Buster-Jangle detonations. From these data a Bhangmeter calibration curve is proposed.

### 2 RESULTS

Bhangmeter readings for Tumbler-Snapper are summarized in Table 1. One typical record for each shot is shown in Fig. 1.

The proposed calibration curve is presented in Fig. 2. Time-to-minimum vs official yield is plotted for Sandstone, Ranger, Greenhouse, Buster-Jangle, Tumbler-Snapper, and Ivy King detonations. At the present state of the art it seems that the nominal tolerance of  $\pm 20$  per cent placed on Bhangmeter yield conversions is perfectly valid above 5 Kt, and in fact the conversion shown agrees much more closely in the range from 5 to 35 Kt with airdrops and from 20 to 80 Kt with tower shots. It is probable that the proportionate effect of surrounding mass causes the greater discrepancy appearing in the 1-Kt Jangle shots, the airdrops below 3 or 4 Kt, and in tower shots of less than 20 Kt yield.

### 3 CONCLUSIONS AND RECOMMENDATIONS

The Mod II Bhangmeter was designed as a portable "package" with self-contained power and particularly low-drain characteristics. Externally, it was a device of great simplicity, having, in addition to the Land camera, an ON-OFF switch and a push button to apply a base line to the record. Internally, the power connections and servicing procedure were both quite complex. A great deal of compromise in the design was directed toward preserving low-drain operation. Further compromise arose in the attempt to arrange a 1200-volt battery pack that could effectively service 14 voltage taps of varying drain.

As was suggested in the Buster-Jangle Bhangmeter report, WT-403, future design will be greatly enhanced by conversion to 115-volt, 60- to 400-cycle power, which, with the proved performance of the low-drain circuitry, would permit vibrator operation from ordinary storage batteries in an emergency. When properly supplied with power, the basic Mod II Bhangmeter circuit has performed consistently well. An a-c version was made ready to be used on Operation Ivy.

Table 1—TUMBLER-SNAPPER BHANGMETER READINGS

Shot	Station	Bhangmeter serial No.	Reading, msec
TS-1	Control Point*	11, 9	5.5, 5+
	CP Hill	3, 6, 12	5, 5+, 5+
	Strike aircraft	1, 2	4.5, 4.5
TS-2	Control Point	3, 6	5.25, 5.0
		9, 10, 12	5 0, †, 5.0
	Strike aircraft	1, 2	4.0, 4.0
TS-3	Control Point	3, 9	18.25, 18
		10, 11, 12	†, 18.5, blank
	Strike aircraft	1, 2	18.5, 18.5
TS-4	Control Point	11, 9	Blank, 15
		10, 3, 12	16, 15, 14.7
	Strike aircraft	1, 2	Blank, 15
TS-5	Control Point	113, 10	12.5, 12.5
		9, 12	12.5, 11
TS-6	Control Point	9, 10	12, 13
		11, 12, 113	13, ~12, 12
TS-7	Control Point	9, 11, 113	14.0, 13.5, 14.5
TS-8	Control Point	10, 12, 113	10, 10, 11

\*Ground Zero and detonation not directly visible.

†Retraced.



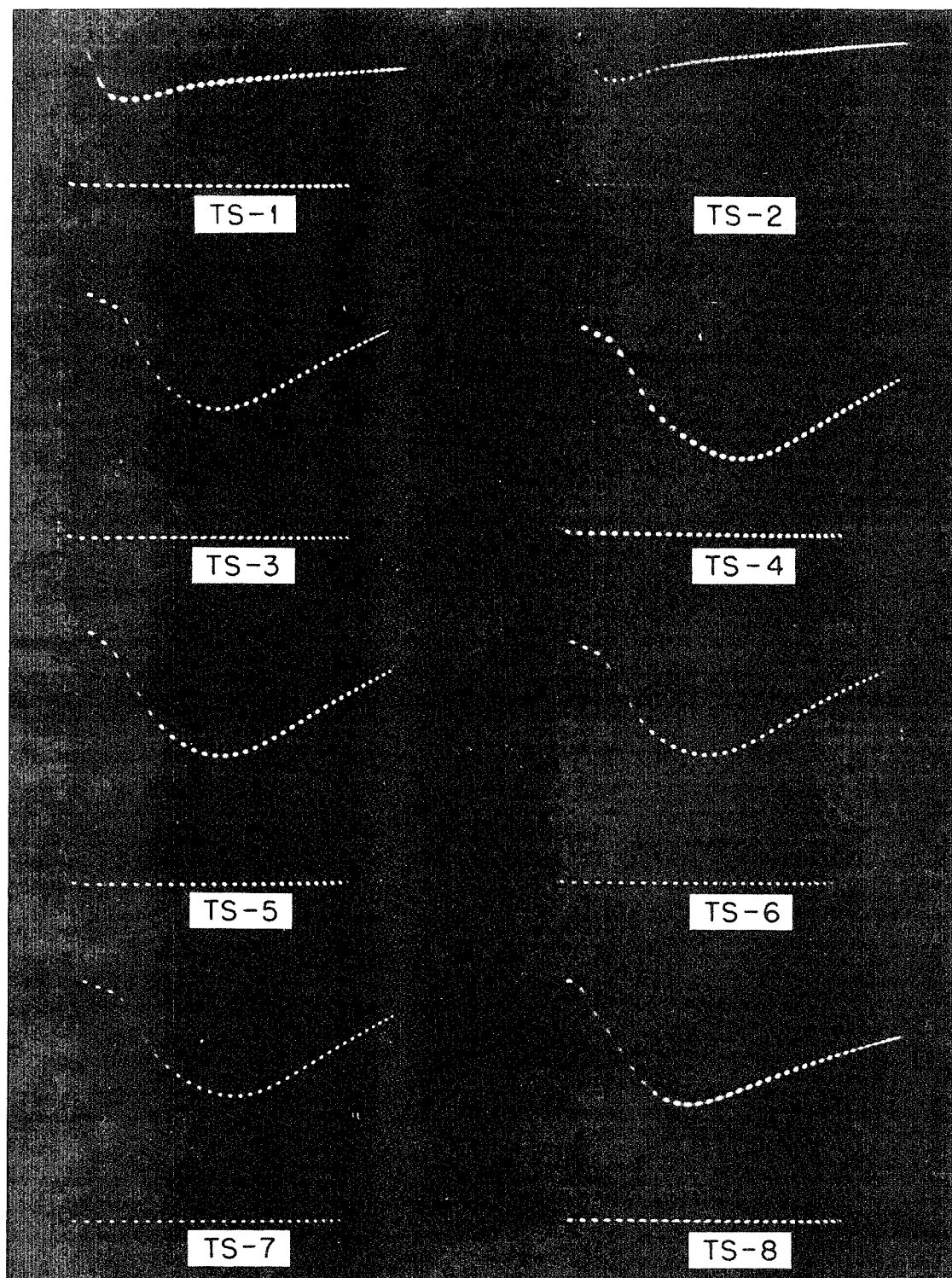


Fig. 1—Bhangmeter millisecond time-mark readings of one typical record for each Tumbler-Snapper shot.

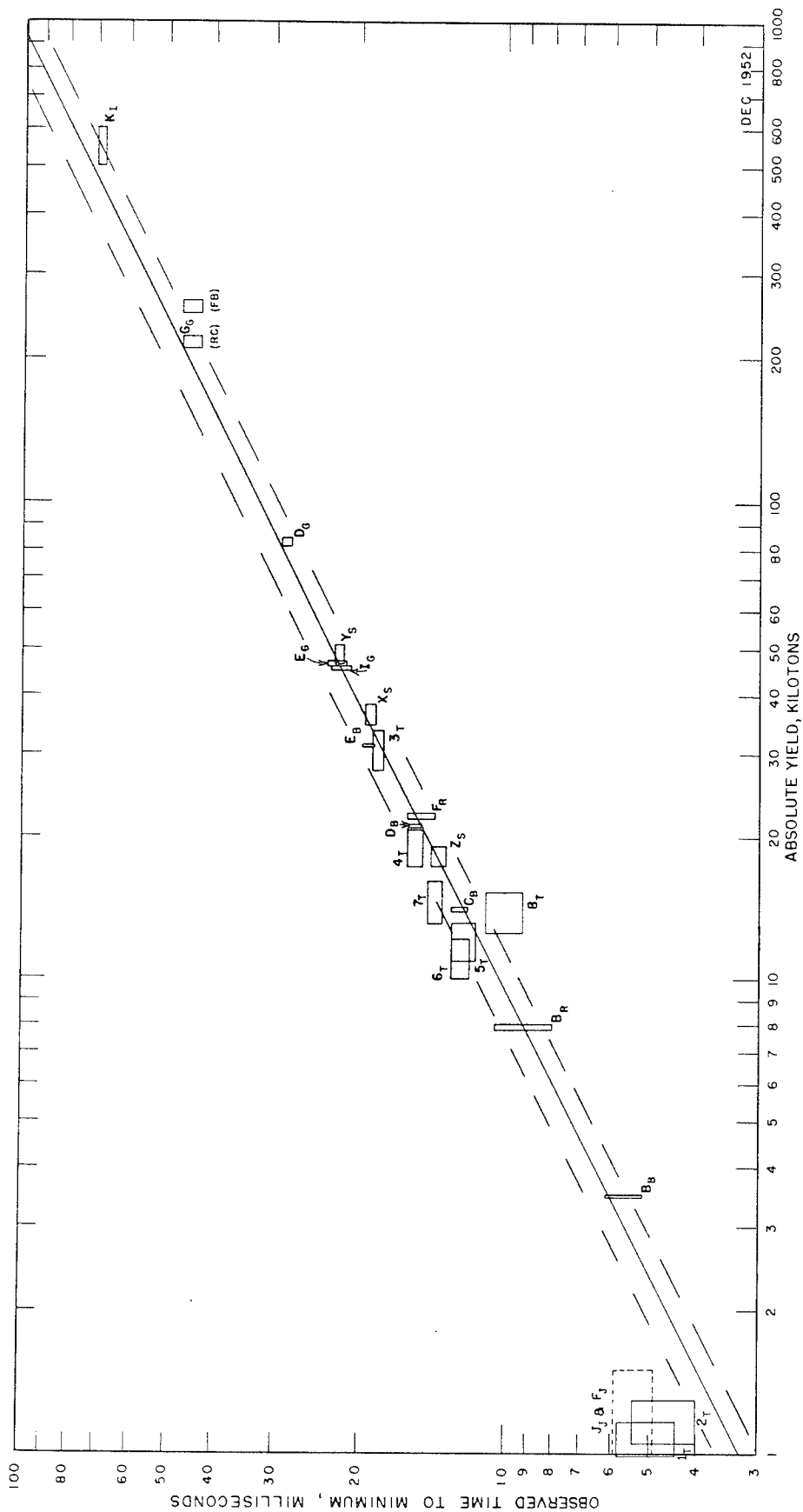


Fig. 2—Proposed calibration curve for time-to-minimum vs yield, plotted for Sandstone, Ranger, Greenhouse, Buster-Jangle, Tumbler-Snapper, and Ivy King detonations. Size of rectangles represent uncertainty. Dashed lines represent  $\pm 20$  per cent yield limits from proposed calibration curve. Subscripts: S, Sandstone; R, Ranger; G, Greenhouse; B, Buster; J, Jangle; T, Tumbler-Snapper; I, Ivy.

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